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Network Storage - The Basics

By Drew Bird
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Are you new to network storage? If so then this series of articles is for you! Over the next few months we are going to take a look at the basic principles of network storage and answer questions like 'What is network storage?' and 'Why do we use it?' After covering the basics, subsequent articles will look at specific technologies in more detail. All of the articles in the series will have one simple aim; to educate and inform you about network storage. So, without further ado, lets get to it!

In basic terms, network storage is simply about storing data using a method by which it can be made available to clients on the network. Over the years, the storage of data has evolved through various phases. This evolution has been driven partly by the changing ways in which we use technology, and in part by the exponential increase in the volume of data we need to store. It has also been driven by new technologies, which allow us to store and manage data in a more effective manner.

In the days of mainframes, data was stored physically separate from the actual processing unit, but was still only accessible through the processing units. As PC based servers became more commonplace, storage devices went 'inside the box' or in external boxes that were connected directly to the system. Each of these approaches was valid in its time, but as our need to store increasing volumes of data and our need to make it more accessible grew, other alternatives were needed. Enter network storage.

Network storage is a generic term used to describe network based data storage, but there are many technologies within it which all go to make the magic happen. Here is a rundown of some of the basic terminology that you might happen across when reading about network storage.

Direct Attached Storage (DAS)
Direct attached storage is the term used to describe a storage device that is directly attached to a host system. The simplest example of DAS is the internal hard drive of a server computer, though storage devices housed in an external box come under this banner as well. DAS is still, by far, the most common method of storing data for computer systems. Over the years, though, new technologies have emerged which work, if you'll excuse the pun, out of the box.

Network Attached Storage (NAS)
Network Attached Storage, or NAS, is a data storage mechanism that uses special devices connected directly to the network media. These devices are assigned an IP address and can then be accessed by clients via a server that acts as a gateway to

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the data, or in some cases allows the device to be accessed directly by the clients without an intermediary.

The beauty of the NAS structure is that it means that in an environment with many servers running different operating systems, storage of data can be centralized, as can the security, management, and backup of the data. An increasing number of companies already make use of NAS technology, if only with devices such as CD-ROM towers (stand-alone boxes that contain multiple CD-ROM drives) that are connected directly to the network.

Some of the big advantages of NAS include the expandability; need more storage space, add another NAS device and expand the available storage. NAS also bring an extra level of fault tolerance to the network. In a DAS environment, a server going down means that the data that that server holds is no longer available. With NAS, the data is still available on the network and accessible by clients. Fault tolerant measures such as RAID, which we'll discuss later), can be used to make sure that the NAS device does not become a point of failure.

Storage Area Network (SAN)

A SAN is a network of storage devices that are connected to each other and to a server, or cluster of servers, which act as an access point to the SAN. In some configurations a SAN is also connected to the network. SAN's use special switches as a mechanism to connect the devices. These switches, which look a lot like a normal Ethernet networking switch, act as the connectivity point for SAN's. Making it possible for devices to communicate with each other on a separate network brings with it many advantages. Consider, for instance, the ability to back up every piece of data on your network without having to 'pollute' the standard network infrastructure with gigabytes of data. This is just one of the advantages of a SAN which is making it a popular choice with companies today, and is a reason why it is forecast to become the data storage technology of choice in the coming years. According to research company IDC, SAN's will account for 70% of all network storage by 2004.

Irrespective of whether the network storage mechanism is DAS, NAS or SAN, there are certain technologies that you'll find in almost every case. The technologies that we are referring to are things like SCSI and RAID. For years SCSI has been providing a high speed, reliable method for data storage. Over the years, SCSI has evolved through many standards to the point where it is now the storage technology of choice. Related, but not reliant on SCSI, is RAID. RAID (Redundant Array of Independent Disks) is a series of standards which provide improved performance and/or fault tolerance for disk failures. Such protection is necessary as disks account for 50% of all hardware device failures on server systems. Like SCSI, RAID, or the technologies used to implement it, have evolved, developed and matured over the years.

In addition to these mainstays of storage technology, other technologies feature in our network storage picture. One of the most significant of these technologies is Fibre channel (yes, that that's fiber with an 're'). Fibre Channel is a technology used to interconnect storage devices allowing them to communicate at very high speeds (up to 10Gbps in future implementations). As well as being faster than more traditional storage technologies like SCSI, Fibre Channel also allows for devices to be connected over a much greater distance. In fact, Fibre Channel can be used up to six miles. This allows devices in a SAN to be placed in the most appropriate physical location.

Other developments are coming through that will change the way that we use and access network storage. One of these advances pegged to make a large contribution to the growing success of network storage in general is iSCSI. iSCSI is a technology that allows data to be transported to and from storage devices over an IP network. What it actually does is serialize the data from a SCSI connection. Using iSCSI, the concept of network storage can be taken anywhere that IP can go, which as the Internet proves, is basically anywhere. Technologies like Fibre Channel and iSCSI are a big factor in how fast people are able to afford and implement network storage solutions.

Over the coming months, we'll be taking a detailed look at all of the technologies that we have discussed in this introductory article. In our next article we'll start by

taking a detailed look at perhaps the most significant element of today's network storage environment - SAN's. We'll also examine the devices used to create them. In addition, we'll be asking and answering the question 'How can a SAN benefit your business?' Stay tuned.

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Storage Basics: Storage Area Networks

By Drew Bird
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Many IT organizations today are scratching their heads debating whether the advantages of implementing a SAN solution justify the associated costs. Others are trying to get a handle on today's storage options and whether SAN is simply Network Attached Storage spelled backwards. In this article, I introduce the basic purpose and function of a SAN and examine its role in modern network environments. I also look at how SANs meet the network storage needs of today's organizations and answer the question, could a SAN be right for you.

Peel away the layers of even the most complex technologies and you are likely to find that they provide the most basic of functions. This is certainly true of storage area networks (SANs). Behind the acronyms and revolutionary headlines, lies a technology designed to provide a way of offering one of the oldest of network services, that of making access to data storage devices available to clients.

In very basic terms, a SAN can be anything from two servers on a network accessing a central pool of storage devices to several thousand servers accessing many millions of megabytes of storage. Conceptually, a SAN can be thought of as a separate network of storage devices physically removed from, but still connected to, the network. SANs evolved from the concept of taking storage devices, and therefore storage traffic, off the LAN and creating a separate back-end network designed specifically for data.

SANs represent the evolution of data storage technology to this point. Traditionally, on client server systems, data was stored on devices either inside or directly attached to the server. Next in the evolutionary scale came Network Attached Storage (NAS) which took the storage devices away from the server and connected them directly to the network. SANs take the principle one step further by allowing storage devices to exist on their own separate network and communicate directly with each other over very fast media. Users can gain access to these storage devices through server systems which are connected to both the LAN and the SAN.

This is in contrast to the use of a traditional LAN for providing a connection for server-storage, a strategy that limits overall network bandwidth. SANs address the bandwidth bottlenecks associated with LAN based server storage and the scalability limitations found with SCSI bus based implementations. SANs provide modular scalability, high-availability, increased fault tolerance and centralized storage management. These advantages have led to an increase in the popularity of SANs as they are quite simply better suited to address the data storage needs of today's data intensive network environments.

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The advantages of SANs are numerous, but perhaps one of the best examples is that of the serverless backup (also commonly referred to as 3rd Party Copying). This system allows a disk storage device to copy data directly to a backup device across the high-speed links of the SAN without any intervention from a server. Data is kept on the SAN, which means the transfer does not pollute the LAN, and the server processing resources are still available to client systems.

SANs are most commonly implemented using a technology called Fibre channel (yes, that's fibre with an 're', not an 'er'). Fibre Channel is a set of communication standards developed by the American National Standards Institute (ANSI). These standards define a high-performance data communications technology that supports very fast data rates (over 2Gbps). Fibre channel can be used in a point-to-point configuration between two devices, in a 'ring' type model known as an arbitrated loop, and in a fabric model.

Devices on the SAN are normally connected together through a special kind of switch, called a Fibre Channel switch, which performs basically the same function as a switch on an Ethernet network, in that it acts as a connectivity point for the devices. Because Fibre channel is a switched technology, it is able to provide a dedicated path between the devices in the fabric so that they can utilize the entire bandwidth for the duration of the communication.

The storage devices are connected to Fibre Channel switch using either multimode or single mode fiber optic cable. Multimode for short distances (up to 2 kilometers), single mode for longer. In the storage devices themselves, special fiber channel interfaces provide the connectivity points. These interfaces can take the form of built in adapters, which are commonly found in storage subsystems designed for SANs, or can be interface cards much like a network card, which are installed into server systems.

So, the question that remains is this. Should you be moving away from your current storage strategy and towards a SAN? The answer is not a simple one. If you have the need to centralize or streamline your data storage then a SAN may be right for you. There is, of course, one barrier between you and storage heaven, and that's money. While SANs remain the domain of big business, the price tag's of SAN equipment is likely to remain at a level outside the reach of small or even medium sized businesses. As the prices fall, however, SANs will find their way into organizations of all sizes, including, if you want, yours.

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storage switch

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Technology

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Computer Desktop Encyclopedia

storage switch

A device that routes data between servers and disk arrays in a storage area network (SAN). It typically refers to a Fibre Channel switch. See SAN and Fibre Channel.

Mentioned In

storage switch is mentioned in the following topics:

Emulex	digital signal (Technology)
Fibre Channel switch	file protection (technology)
Snap Server (technology)	IP storage (technology)
KYK-13	Fibre Channel (technology)
Fibre channel port	LAN free backup (technology)

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Fibre Channel switch

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Fibre Channel switch

A Fibre Channel switch is a computer storage device that allows the creation of a Fibre Channel fabric. This fabric is a network of Fibre Channel devices which allows many-to-many communication, device name lookup, security, and redundancy. Major manufacturers of Fibre Channel switches are: Brocade, Cisco, IBM, McData and Qlogic

Fibre Channel fabrics are normally divided into zones to control access.

See also

- Host Truck Adapter (HTA)
- List of Fibre Channel switches
- List of Fibre Channel Host Bus Adapters
- Fibre Channel Port

Mentioned In

Fibre Channel switch is mentioned in the following topics:

storage switch (technology)	Director-class switch (technology)
Fibre Channel fabric	fabric (disambiguation)
List of Fibre Channel Host Bus Adapters	NAS gateway (technology)
LAN free backup (technology)	Brocade Communications Systems
SAN (technology)	IP storage (technology)

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